

REMARKS

Reconsideration of the application in view of the above amendments and the following remarks is requested. Claims 1, 2, 5-7, 9-10, 13-17, 19-25, and 27-30 are in this application. Claims 1, 5, 9-10, 13-14, 17, 20-22, 24-25, and 28-30 have been amended. Claims 3-4, 8, 11-12, 18, and 26 have been cancelled. In addition to the amendments discussed below, the claims have also been amended to provide further clarity and correct inadvertent errors.

Applicant requests the Examiner's permission to amend the drawings as shown in red on the attached two sheets of annotated marked-up drawings. The annotated marked-up drawings, which are attached as Appendix A, changes FIG. 3C to FIG. 3D, adds a mask 341 in new FIG. 3D, and adds a new FIG. 3C that illustrates the formation of mask 341 on planarized polysilicon layer 340. In addition, two replacement drawing sheets that include the changes are attached in Appendix B. Further, the specification has been amended to reflect the reference numerals.

The Examiner objected to the amendment mailed on March 15, 2002 under 35 U.S.C. §132 as introducing new matter into the disclosure. In objecting to the amendment, the Examiner indicated that there is support for the formation of a layer of third material over a planarized layer of material, but argued that there is no support for a layer of material 342 that lowers resistance.

The specification has been amended to recite:

"As shown in FIG. 3D, a layer of material 342 is formed over planarized polysilicon layer 340." (See the fifth paragraph of page 5, as amended above.)

The phrase "that lowers resistance" has been deleted. Thus, from what applicant can determine, no new matter has been introduced into the disclosure.

The Examiner rejected claims 19-23 and 25 under 35 U.S.C. §112, first paragraph. In rejecting the claims, the Examiner argued that there is no support in

the specification as originally filed for the limitations in claim 22 that require that the third layer of material lower the resistance of the layer of first material.

Applicant notes that applicant's originally-filed specification teaches:

"After this, as shown in FIG. 3B, oxide layer 330 and polysilicon layer 320 are chemically-mechanically polished until oxide layer 330 is substantially, completely removed from the surface of polysilicon layer 320 to form a planarized layer of polysilicon 340." (See page 5, lines 13-16.)

Thus, applicant's originally-filed specification teaches that polysilicon layer 320, which can be read to be a layer of first material, and oxide layer 330, which can be read to be a layer of second material, are chemically-mechanically polished to form a planarized layer of polysilicon 340, which can be read to be the planarized layer of material.

In addition, applicant's originally-filed specification also recites,

"Once planarized polysilicon layer 340 has been formed, a mask (not shown) is formed and patterned on planarized polysilicon layer 340.

Next, planarized polysilicon layer 340 is etched to form a number of structures, such as local interconnect lines, that are electrically connected to individual devices on wafer 300. (The locations where the structures make electrical contacts with the individual devices of wafer 300 are prepared before polysilicon layer 320 is deposited, and are assumed to be a part of wafer 300.)

Alternately, after the planarization step, one or more additional layers of material, such as materials which lower the resistance of polysilicon, can be formed over layer 340. The mask is then formed and patterned on the additional layers of material which are then etched along with planarized polysilicon layer 340 to form the structures (e.g., local interconnect lines)." [Underlining added.] (See page 5, line 16, to page 6, line 1.)

Thus, if one additional layer of material is used, the one additional layer of material can be read to be a third layer of material, and can be represented by layer of material 342. In addition, the above section of applicant's specification also

indicates that the one additional layer of material (layer 342) can lower the resistance of polysilicon.

In responding to applicant's comments, the Examiner stressed that the specification as originally filed does not support the formation of a layer of material over the polysilicon layer that reduces the resistance of the polysilicon layer. "There is no implicit or explicit reference to third layer, i.e., layer 342 as a material being lowering (reducing) the resistance of the first layer 340 (i.e., the planar polysilicon layer)." (See page 13, lines 7-9 of the February 23, 2005 office action.)

Applicant respectfully does not understand the argument set forth by the Examiner as the originally-filed specification states that one additional layer of material (layer 342), "such as materials which lower the resistance of polysilicon," can be formed over polysilicon layer 340. Thus, the originally-filed specification expressly states that one additional layer of material can be formed over polysilicon layer 340, and the one additional layer can be formed from a material which lowers the resistance of polysilicon.

In addition, the Examiner argued that even if layer 342 was considered to be a material that lowers the resistance of polysilicon, the claims violate the first paragraph of section 112 for not having enabled the material in question because there is no implicit, explicit, or exemplary description of the type of third material that would have the ability to reduce the resistance of polysilicon.

Applicant notes, however, that a specification need not disclose that which is well-known in the art. See, e.g., Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1385, 231 USPQ 81, 94 (Fed. Cir. 1986). Thus, if the use of materials to reduce the resistance of polysilicon is well-known in the art, applicant's specification need not provide examples of those materials. In the present case, the use of metal silicides to reduce the resistance of polysilicon is well-known in the art.

As an example, applicant has attached pages 162-163 of Wolf, "Silicon Processing for the VLSI Era, Volume 2: Process Integration," Lattice Press, 1990, as Appendix C, pages 397-399 of Wolf, "Silicon Processing for the VLSI Era, Volume 1:

Process Technology," Lattice Press, 1986, as Appendix D, and eight pages (unnumbered) from www.mosis.org/Faqs/faq-wafer-specs.html (see question 8), which was downloaded from the internet on May 18, 2005 as Appendix E.

Thus, without further direction from the Examiner, applicant does not understand the Examiner's basis for asserting that the originally-filed specification does not support the formation of an additional layer of material over planarized polysilicon layer 340 that lowers the resistance of polysilicon.

From what applicant can determine, the originally-filed specification provides all of the necessary support. Therefore, since the originally-filed specification provides the necessary support, claims 19-23 satisfy the requirements of the first paragraph of 35 U.S.C. §112 with respect to the third layer of material lowering the resistance of the layer of first material.

In further rejecting the claims under 35 U.S.C. §112, first paragraph, the Examiner argued that there is no support in the specification for the limitations in claim 25 that require that the layer of third material be selectively etched during the selective etching process. In an effort to further prosecution, applicant has amended claims 24 and 25 to include a method element of forming a mask.

Claim 24 has been amended to recite:

"forming a mask on the planarized layer of material that covers the wafer upper levels and the wafer lower level of the top surface of the wafer."

As noted above, the as-filed specification teaches, on page 5, lines 16-18, that once:

"planarized polysilicon layer 340 has been formed, a mask (not shown) is formed and patterned on planarized polysilicon layer 340."

Thus, applicant's as-filed specification provides support for the limitations of claim 24.

Claim 25 has been amended to recite:

“forming a layer of third material on the planarized layer of material, the mask being formed on the layer of third material.”

As noted above, the as-filed specification teaches, from page 5, line 27 to page 6, line 1, that the:

“mask is then formed and patterned on the additional layers of material which are then etched along with planarized polysilicon layer 340 to form the structures (e.g., local interconnect lines).”

Thus, applicant's as-filed specification provides support for the limitations of claim 25. Therefore, since the originally-filed specification provides the necessary support, claim 25 satisfies the requirements of the first paragraph of 35 U.S.C. §112 with respect to the formation of a mask.

The Examiner rejected claims 1-2, 5-7, 10, 13-16, 19-25, and 27-30 under 35 U.S.C. §102(e) as being anticipated by Li et al. (U.S. Patent No. 6,162,368). For the reasons set forth below, applicant respectfully traverses this rejection.

Claim 1 recites, in part,

“forming a layer of first material . . . ;

“forming a layer of second material on the top surface of the layer of first material; and

“chemically-mechanically polishing the layer of second material and the underlying layer of first material . . . , the layer of first material having a substantially planar top surface when the layer of second material is substantially all removed from the layer of first material.”

Independent claim 9, 22, 24, 29, and 30 recite the same limitations. (The term “until” was deleted to remove any limitation as to when the polishing stops.)

In rejecting the claims, the Examiner pointed to the step of forming the layer of polysilicon 16 shown in FIGS. 2A-2C of Li as constituting the element of forming a

layer of first material required by the claims, and the step of forming native oxide layer 18 shown in FIGS. 2A-2B of Li as constituting the element of forming a layer of second material. The Examiner also pointed to the chemical-mechanical polishing steps shown in FIGS. 2B-2E of Li as constituting the polishing element required by the claims.

The chemical-mechanical polishing shown in Li, however, can not be read to be the chemical-mechanical polishing required by the claims. This is because the claims require that the layer of first material have a substantially planar top surface when the layer of second material is substantially all removed. As shown in FIG. 2C of Li, when native oxide layer 18 (read to be the layer of second material) is substantially all removed, polysilicon layer 16 (read to be the layer of first material) does not have a substantially planar top surface, but instead has a severely non-planar top surface.

As a result, the chemical-mechanical polishing shown in Li can not be read to be the chemical-mechanical polishing required by the claims. Therefore, since the Li reference does not teach or suggest the chemical-mechanical polishing element required by independent claims 1, 22, 24, 29, and 30, claims 1, 22, 24, 29, and 30 are not anticipated by Li.

In addition, since claims 2, 5-7, 10, and 13-16 depend either directly or indirectly from claim 1, these claims are not anticipated by Li for the same reasons as claim 1. Further, since claims 19-21 and 23 depend either directly or indirectly from claim 22, claims 19-21 and 23 are not anticipated by Li for the same reasons as claim 22. Similarly, since claims 25 and 27-28 depend either directly or indirectly from claim 24, claims 25 and 27-28 are not anticipated by Li for the same reasons as claim 24.

With further respect to claims 22 and 30, these claims recite, in part:

“forming a layer of third material on the planarized layer
of material.”

In rejecting the claims, the Examiner pointed to the step of forming layer 106 or 114 as constituting the element of forming a layer of third material. However, the structures shown in FIGs. 2E and 2F of the Li reference that are identified by reference numerals 106 and 114 are not a layer of material, but are instead the outer layer of outer polishing pad 100, and a soft layer of polishing pad 110. (See column 3, lines 12-15 and lines 28-29 of Li.)

Thus, since Li fails to teach or suggest the formation of a layer of third material, claims 22 and 30 are not anticipated by the Li reference for this additional reason. In addition, since claims 19-21 and 23 depend from claim 22, claims 19-21 and 23 are not anticipated by Li for the same reasons as claim 22. (From what applicant can determine, the Examiner did not address applicant's argument that element 106 is a polishing pad and not a layer of material.)

With further respect to claim 24, this claim has been amended to recite:

"forming a mask on the planarized layer of material that covers the wafer upper levels and the wafer lower level of the top surface of the wafer."

Claim 24 was amended to remove any confusion regarding selective etching, as well as the difference between RIE and CMP selective etching, that any earlier comments may have created. Applicant has been unable to identify any discussion in Li that teaches or suggests forming a mask on polysilicon layer 16 (the layer of first material) when polysilicon layer 16 covers the upper levels of regions 14 as required by claim 24. As a result, claim 24 is not anticipated by Li for this additional reason. In addition, since claims 25 and 27-28 depend either directly or indirectly from claim 24, claims 25 and 27-28 are not anticipated by Li for the same reasons as claim 24.

The Examiner also rejected claim 9 under 35 USC §103(a) as being unpatentable over Li in view of Weling et al. (U.S. Patent No. 5,378,318). In

rejecting the claims, the Examiner argued that the Li reference teaches all of the limitations of claim 9 except for the recited etch selectivity. Claim 9 includes the same limitations as claim 1. Thus, in view of the above discussion regarding claim 1, claim 9 is patentable over Li in view of Weling et al. for the same reason that claim 1 is not anticipated by Li.

The Examiner additionally rejected claim 17 under 35 USC §102(e) as being anticipated by Doan et al. (U.S. Patent No. 6,331,488). For the reasons set forth below, applicant respectfully traverses this rejection.

Claim 17 has been amended to recite:

“forming a layer of second material on the top surface of the layer of first material, the second layer of material being thicker than the layer of first material and non-conductive, and having a substantially uniform thickness.”

In rejecting the claims, the Examiner pointed to the formation of insulating material 24, which is shown in FIGS. 4-7 of Doan, as constituting the element of forming a layer of first material required by claim 17. In addition, the Examiner pointed to the formation of deformable material 30, which is shown in FIGS. 5-7 of Doan, as constituting the element of forming a layer of second material required by claim 17.

The Doan reference, however, fails to teach or suggest that deformable material 30 has a substantially uniform thickness, while also being non-conductive, as required by amended claim 17. At column 8, lines 15-17, Doan teaches that deformable material 30 can be any material that readily flows over the surface 28 of the insulating material 24, and is subsequently solidified.

However, when a material that readily flows is formed over an uneven surface, it is not possible for the material to have a substantially uniform thickness. This is because the material settles in the low lying areas, and is not present at all in the higher areas unless the lower and higher areas are both covered. In either case,

it is not possible for a material that readily flows to have a substantially uniform thickness over an uneven surface.

In addition, Doan also teaches that deformable material 30 can be formed from a readily deformable metal (see column 8, lines 19-21 of Doan). A deformable metal, however, can not be read to be non-conductive. Thus, since the Doan reference fails to teach or suggest a layer of second material that is non-conductive, and has a substantially uniform thickness, claim 17 is not anticipated by the Doan reference.

Thus, for the foregoing reasons, it is submitted that all of the claims are in a condition for allowance. Therefore, the Examiner's early re-examination and reconsideration are respectively requested.

Respectfully submitted,

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APPENDIX A

Two Sheets of Annotated Marked-Up Drawings

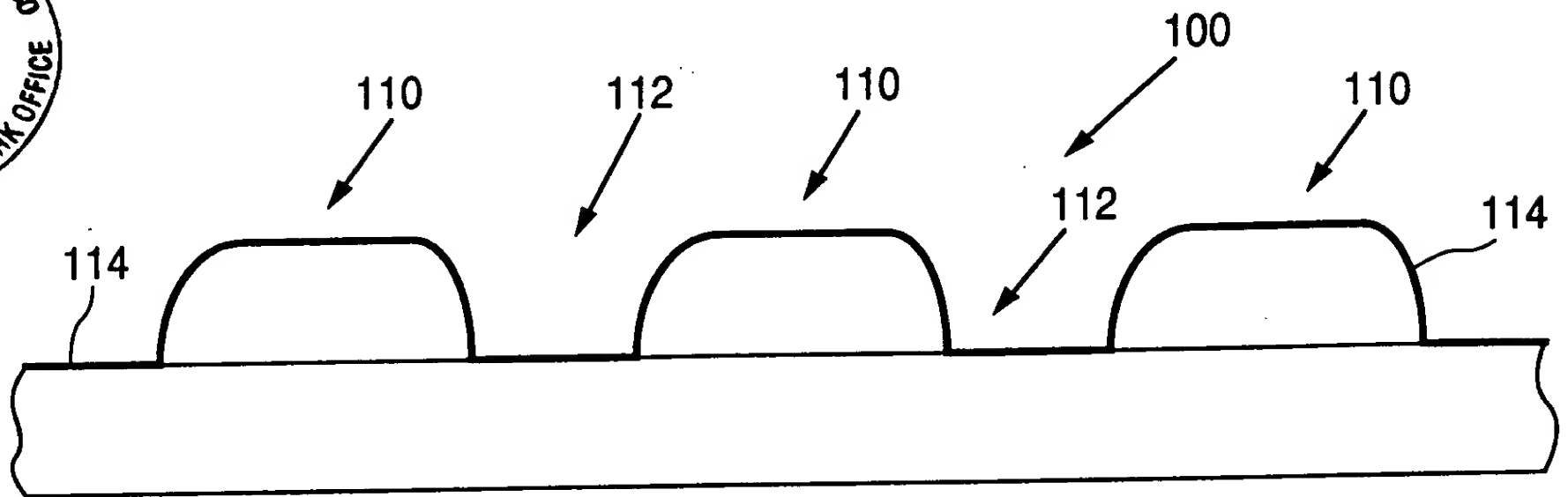


FIG. 1
(PRIOR ART)

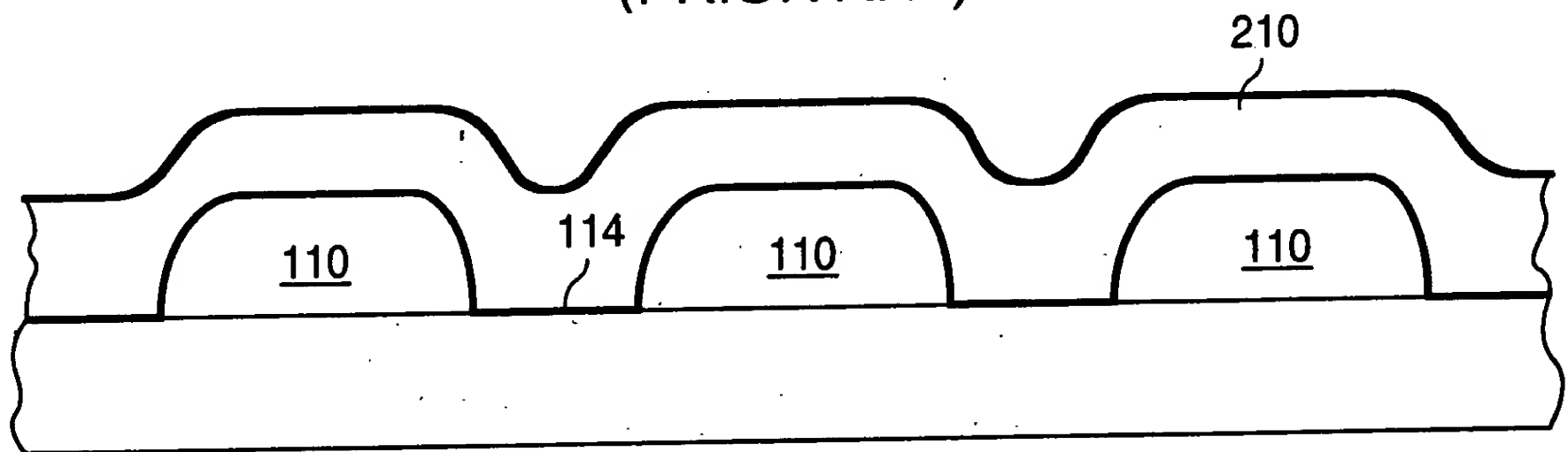


FIG. 2A
(PRIOR ART)

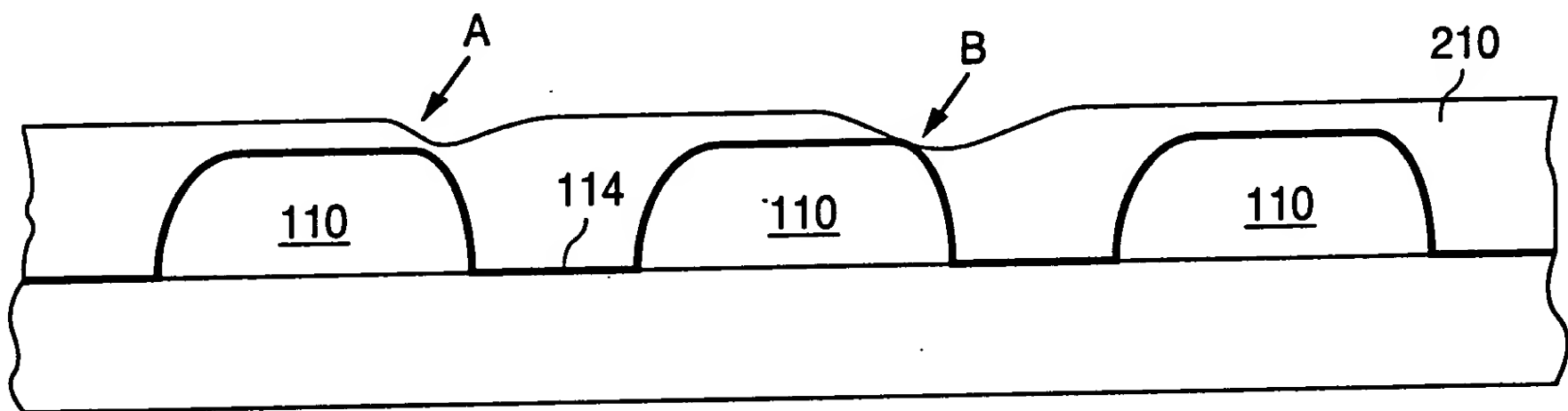


FIG. 2B
(PRIOR ART)

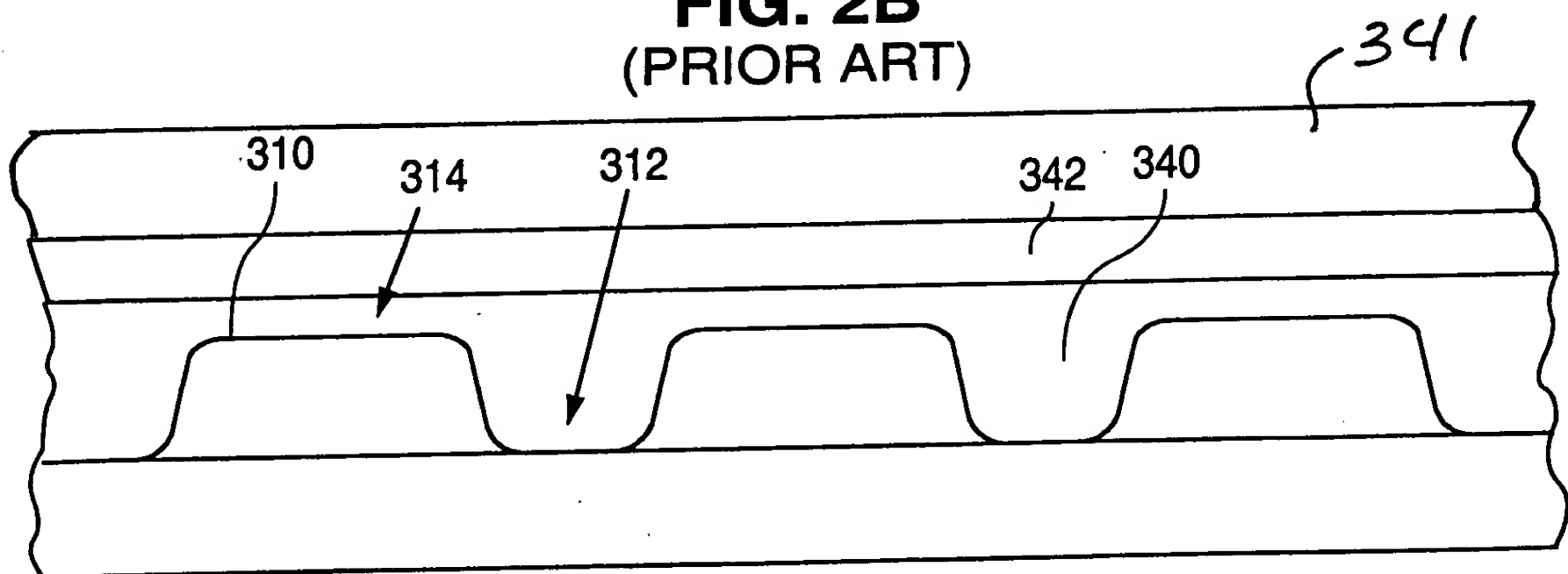


FIG. 3C 3D

Annotated Marked-Up Drawing

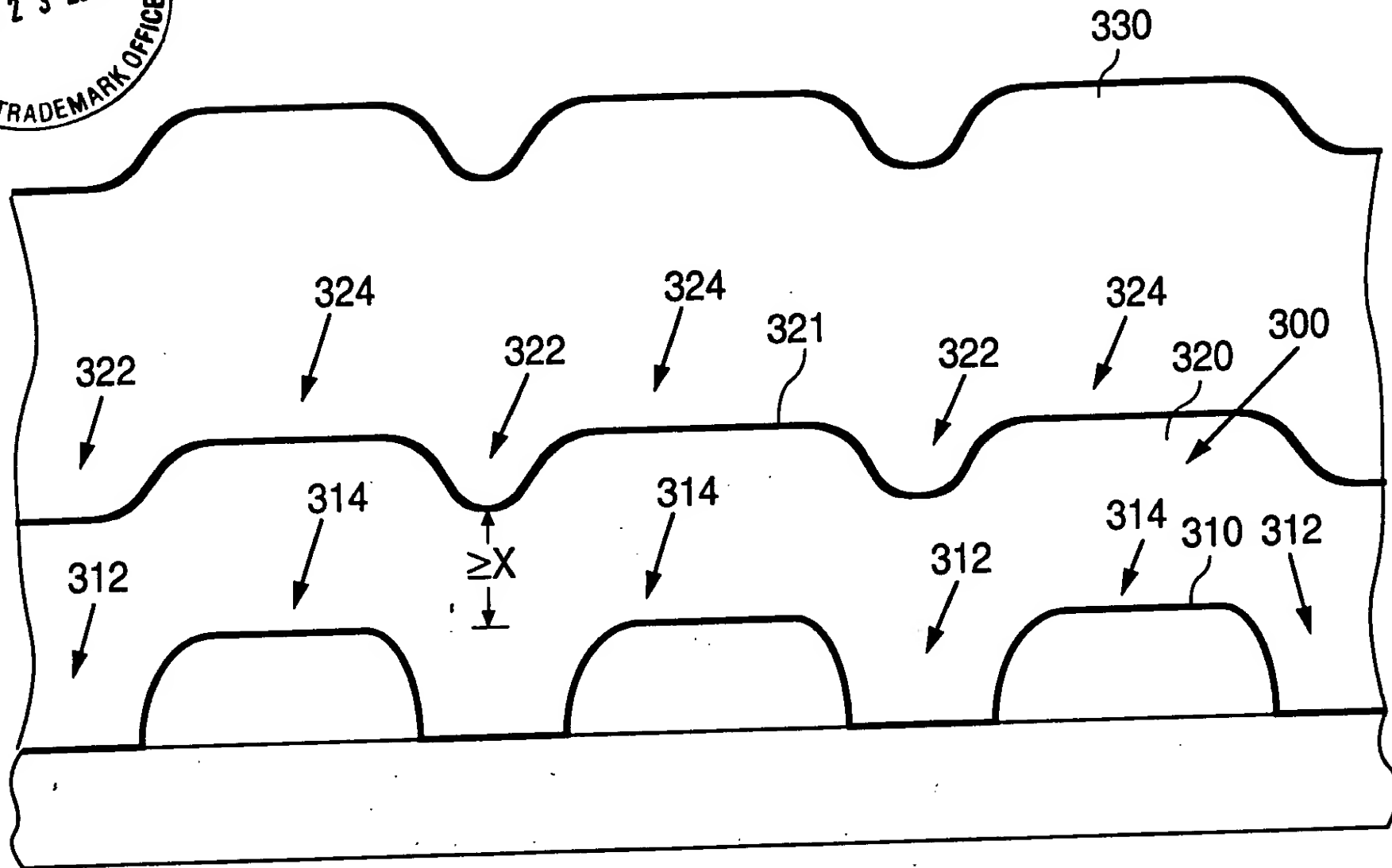


FIG. 3A

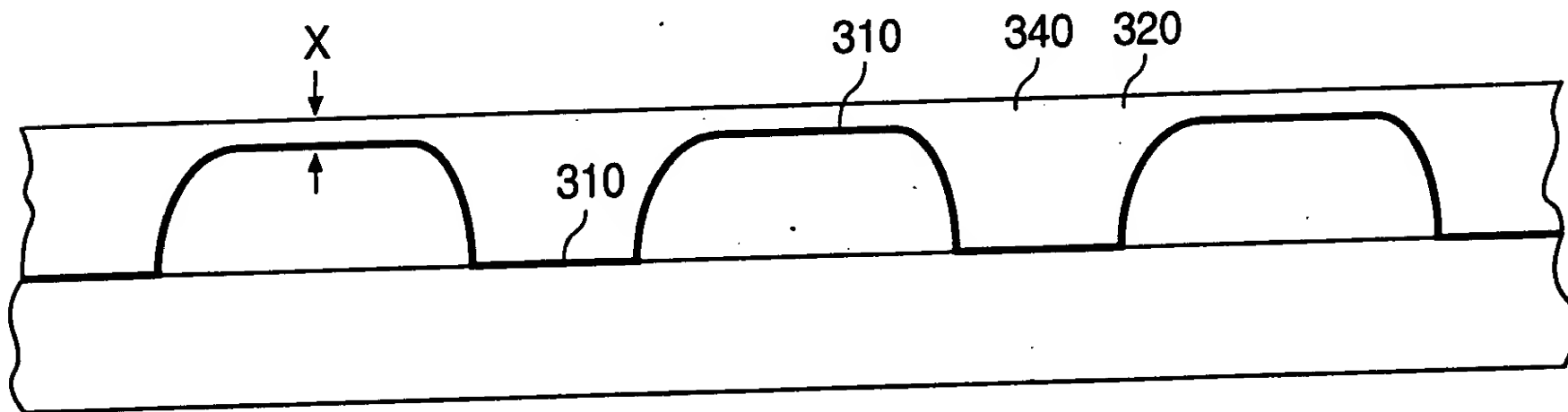


FIG. 3B

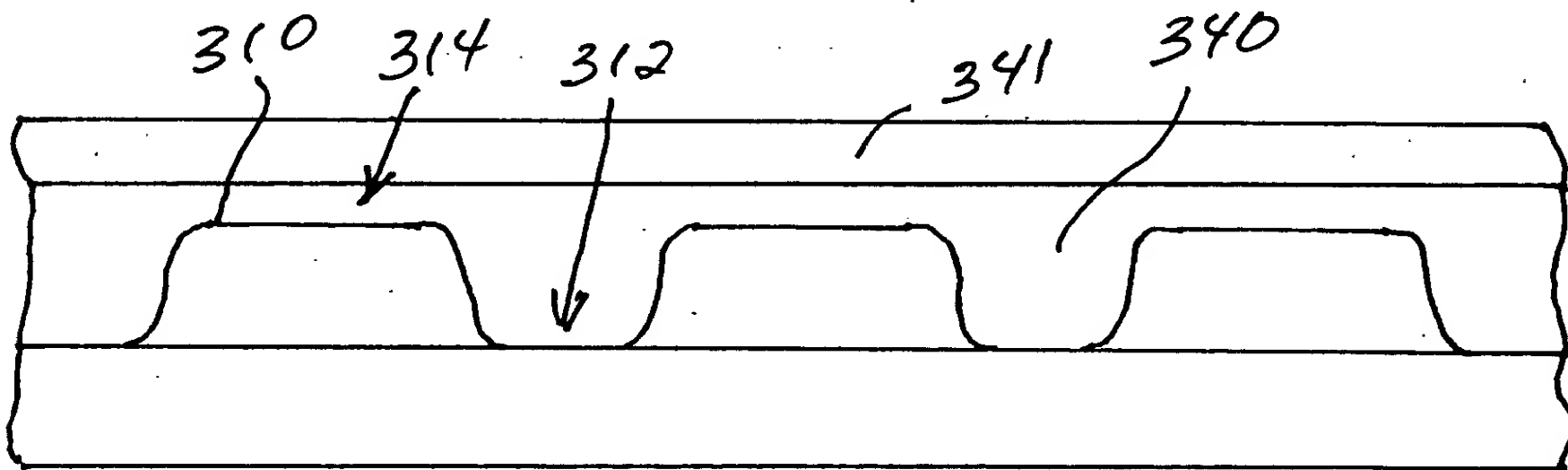


FIG. 3C

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APPENDIX B

Two Replacement Sheets

AMENDMENT IN RESPONSE TO OFFICE
ACTION DATED FEBRUARY 23, 2005

Atty. Docket No. 100-13602
(P04797-C2)

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